Disclaimer: The views expressed are those of Paul Gipe and are not necessarily those of the sponsor.

Disclosure: Paul Gipe has worked with Aerovironment, ANZSES, APROMA, ASES, AusWEA, AWEA, BWEA, BWE, CanWEA, CAW, DGW, DSF, EECA, ES&T, GEO, GPI Atlantic, IREQ, KWEA, MADE, Microsoft, ManSEA, NRCan, NRG Systems, NASA, NREL, NZWEA, ORWWG, OSEA, PG&E, SeaWest, SEI, USDOE, WAWWG, WE Energies, the Folkecenter, the Izaak Walton League, the Minnesota Project, the Sierra Club, and Zond Systems, and written for magazines in the USA, Canada, France, Denmark, and Germany.

Advanced Renewable Tariffs
New Policy Option for North America

Paul Gipe, wind-works.org

North American Energy Policy

North Americans are Dabbling Around the Edges of Renewable Energy Policy

Little Recognition of the Crisis Facing the Continent

Paul Gipe, wind-works.org

Complacency is Not a Policy

Inaction is Not an Option

Paul Gipe, wind-works.org

Skibsted Fjord, Denmark

The Troika of Meeting Demand

- Conservation

  #1 Use Less

- Improve Efficiency

  #2 Do More with Less

- Renewable Energy

  #3 Invest in the Future

Fuchskaute
Höhe Westerwald, Germany

Typical Household Consumption

	kWh/yr/home
Texas	14,000
New Zealand	8,000
California	6,500
The Netherlands	3,000

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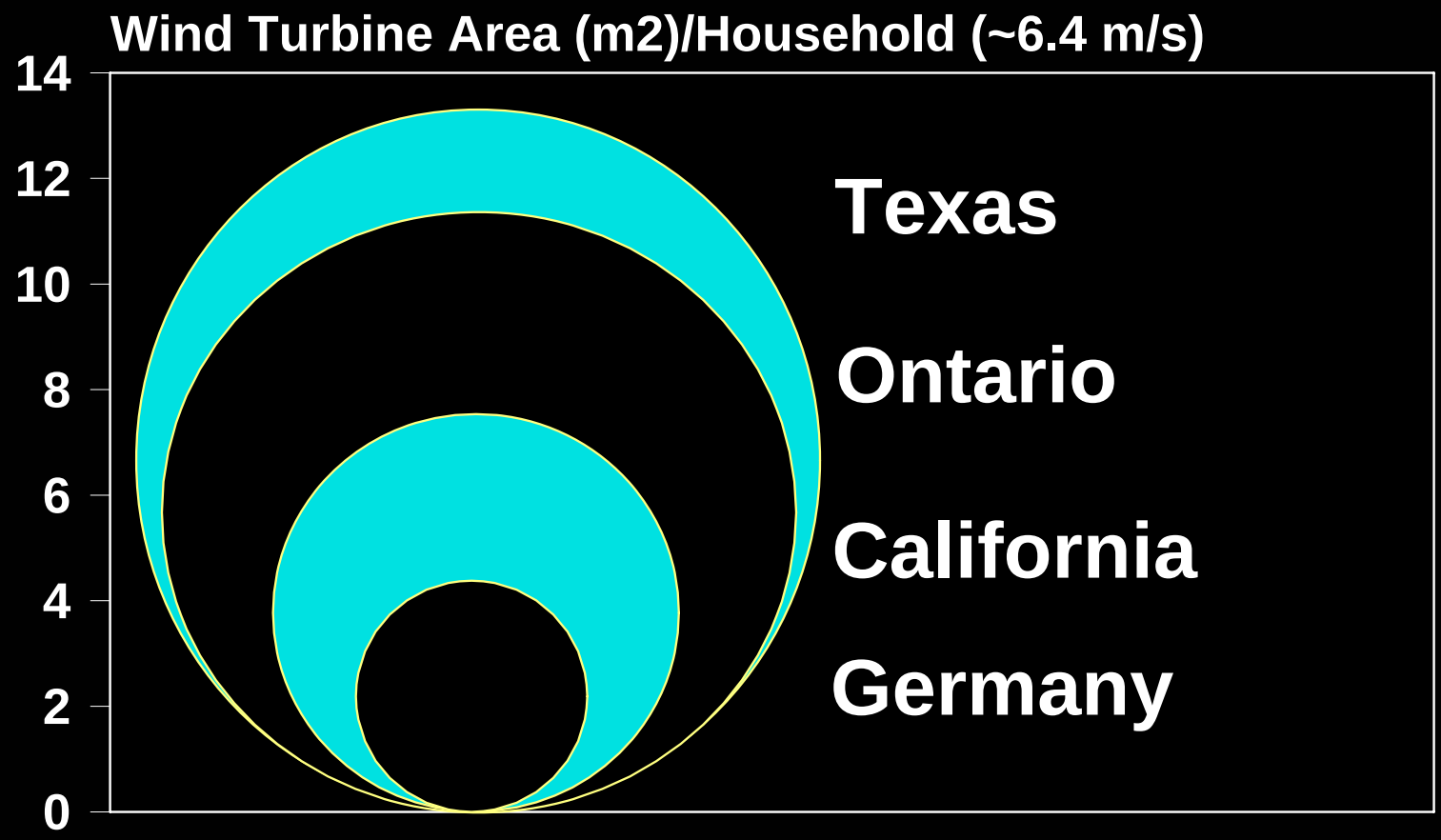
Swept Area per Household



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Wind Energy Has Come of Age

California

Colorado

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Montefalcone, Italy

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Galicia, Spain

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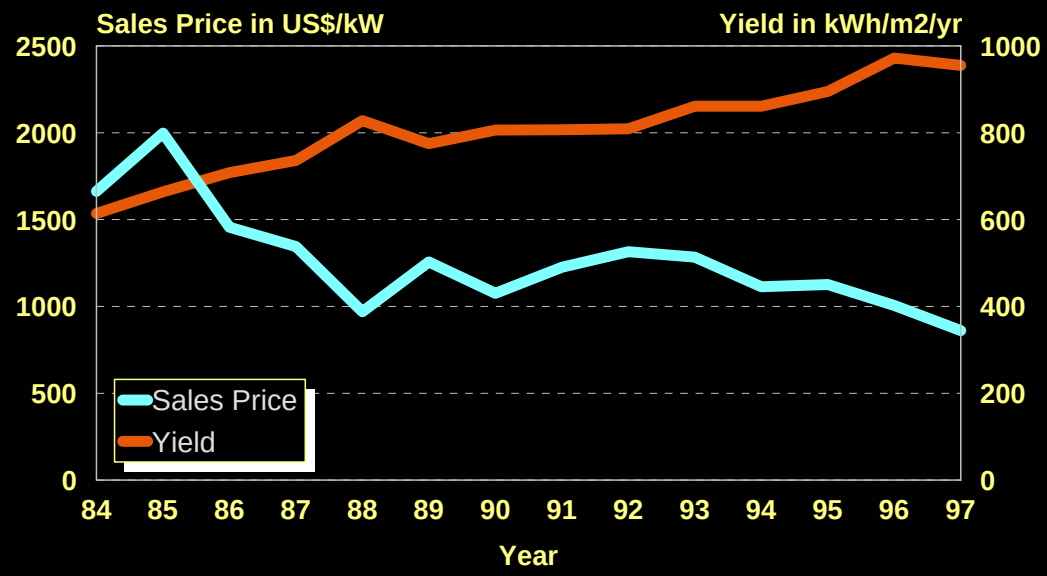
Why Now?

- **Wind Works**
  - Greater Reliability
- **Productivity Improved**
  - More Efficient
  - Taller Towers
- **Costs Declined**
  - Economies-of-Scale



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Northern Ireland

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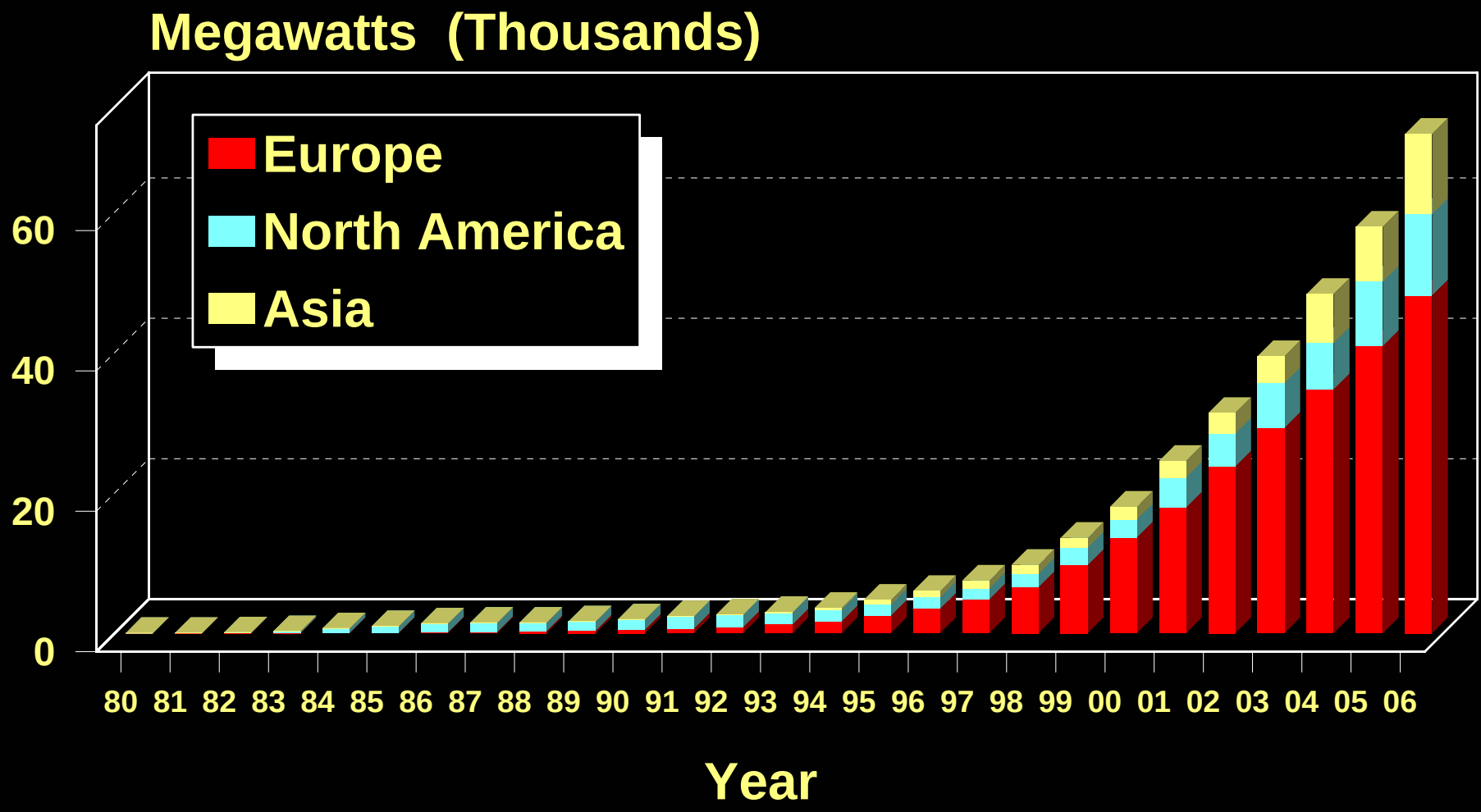
40 m, 500 kW

80 m, 1.8 MW

Kincardine, Ontario

We Know What Works
. . .and What Doesn't

2006 World Wind Capacity



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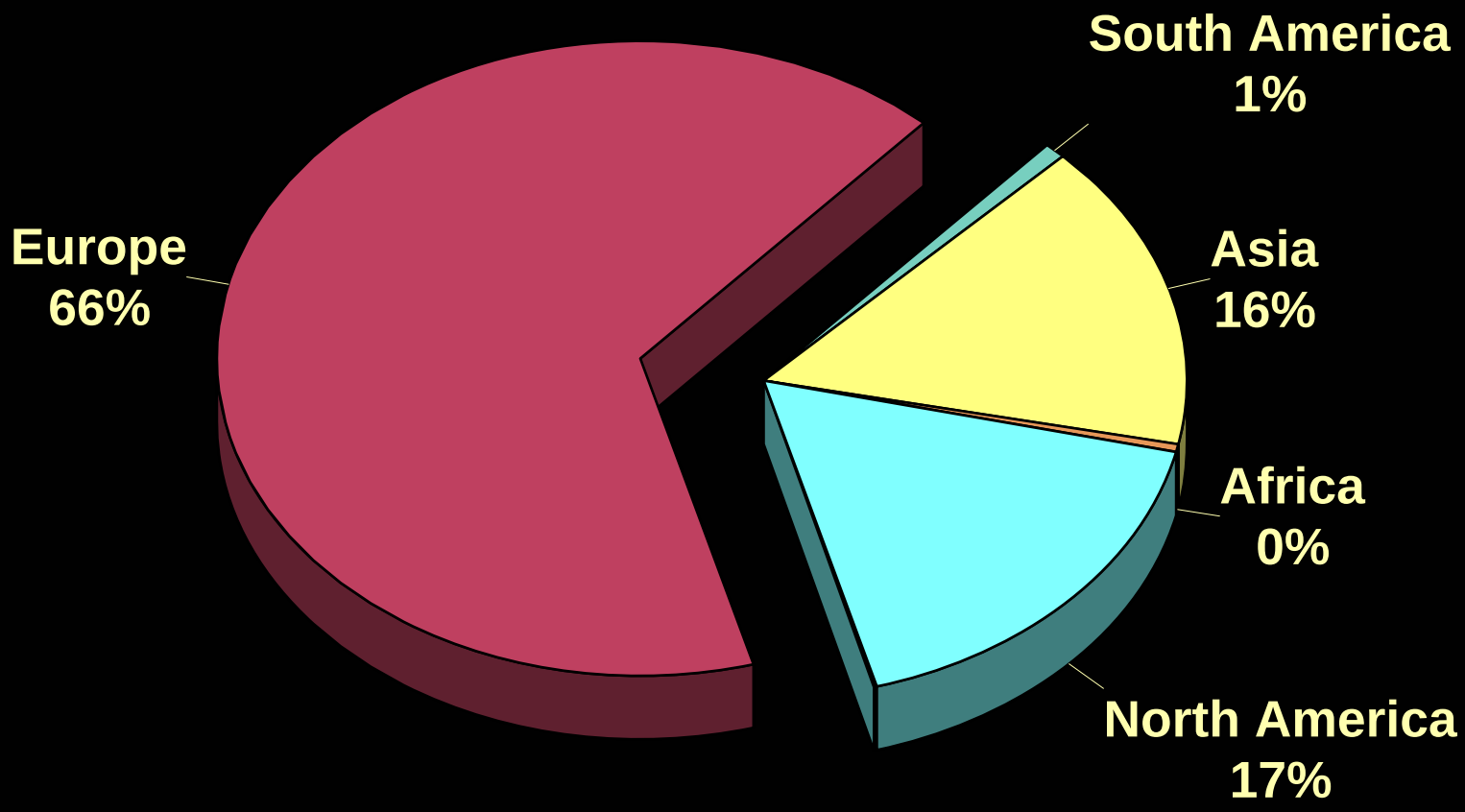
World Wind Capacity 2006
~70,000 MW



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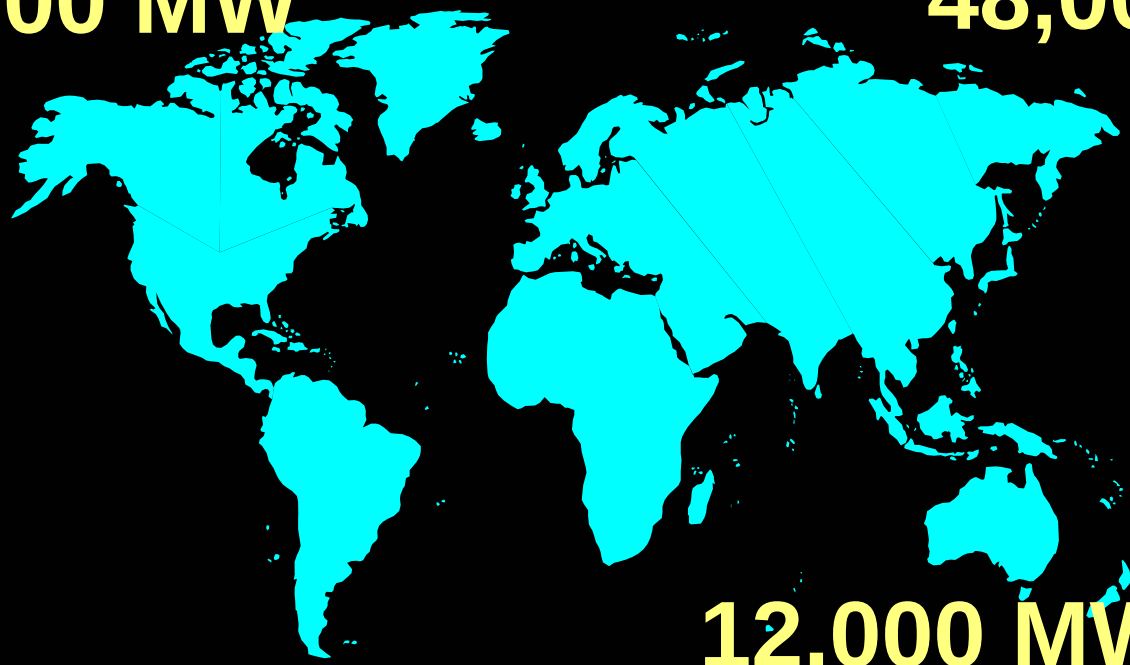
2006 World Wind Capacity



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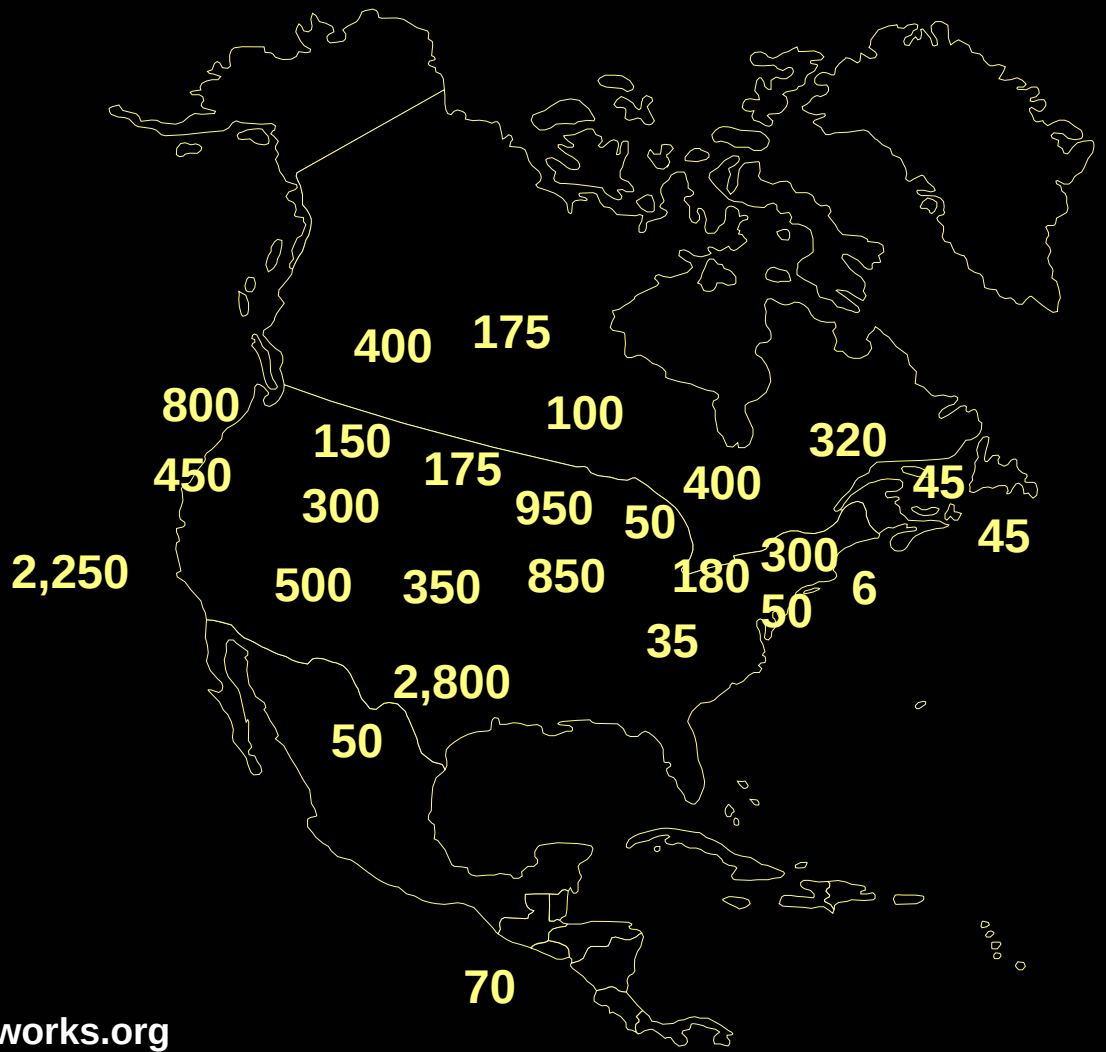
North American Wind Capacity 2006



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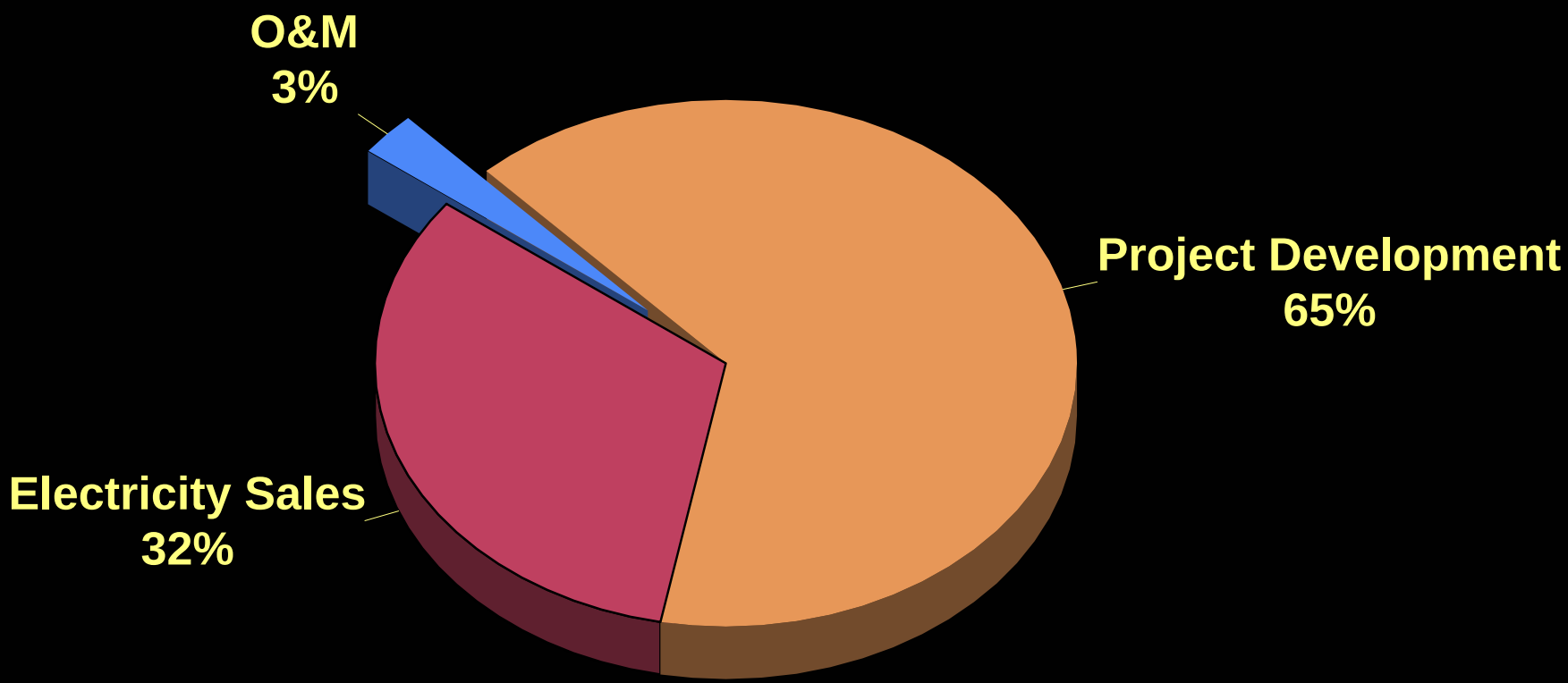
Wind Energy is a Real Business
US$35 Billion in 2006



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Wind Growing Rapidly 2002-2006

- Germany; ~2,400 MW/yr
  - 20,000 MW by 2006
  - 30,000 MW by 2012
- Spain: ~1,700 MW/yr
- USA: ~1,500 MW/yr
- Growth: 20%-40%/yr

Paul Gipe, wind-works.org

Why Wind?

- Reduces Use of Fossil & Nuclear Fuels
- Most Cost-Effective of New Renewables
- Relatively Benign

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Wind is Modular

- Quickly Installed
- When Needed
- As Needed
- Where Needed
- By Anyone

Tehachapi, California

Paul Gipe, wind-works.org

Wind is Flexible

- **Scale**
  - Big or Small Projects
- **Location**
  - Near or Far
- **Time**
  - Short Lead Times
- **Ownership**
  - Local or Absentee

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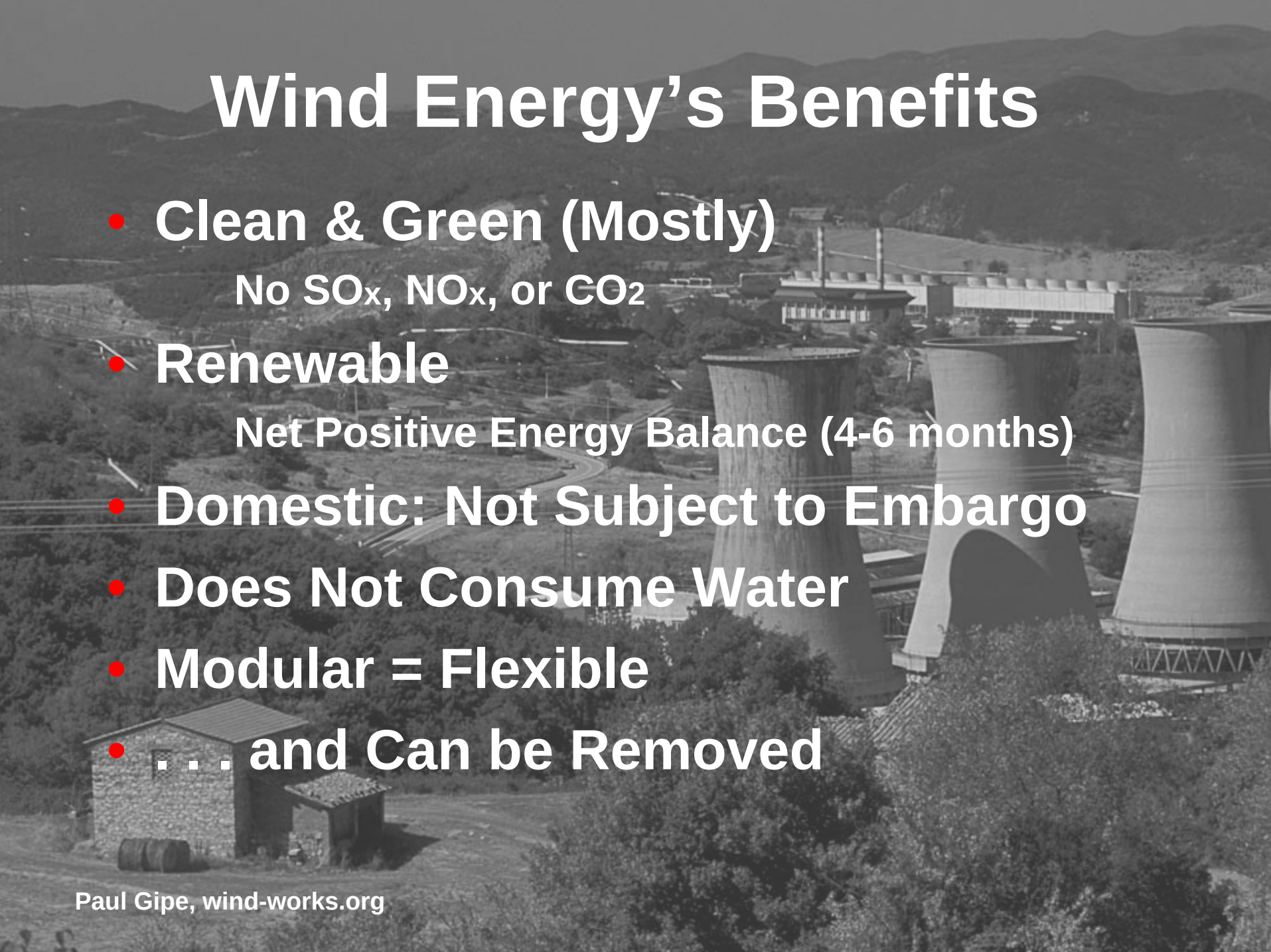
Wind Energy's Benefits

- **Clean & Green (Mostly)**
  - No SO_x, NO_x, or CO_2
- **Renewable**
  - Net Positive Energy Balance (4-6 months)
- **Domestic: Not Subject to Embargo**
- **Does Not Consume Water**
- **Modular = Flexible**
- **. . . and Can be Removed**



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Wind Energy's Impacts

- Aesthetics or Intrusiveness
- Erosion & Scarring from Roads
  - Length, Width, Number and Slope
- Shadow Flicker & Disco Effect
- Climate?
- Noise--They are Audible
- Wildlife
  - Habitat Disruption
  - Bird & Bat Kills: Collisions, Electrocutions

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Birds & Bats

- Serious Problem
  - Tarifa?
  - Altamont Pass (900-1,300 Raptors/yr)
- A Concern Elsewhere
- No Quick Fixes--No Panaceas
  - Stripes & Whistles Don’t Work

Altamont Pass, Calif.

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Birds & Bats

Cros de Gerand, France

- **Before & After Studies of Big Projects**
- **Studies Necessary for Small Projects?**

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Public Safety

- No Passerby Killed or Injured
- Ice Throw
  - Max. 100 m
  - 1.5 X Height
  - Post Warnings
- Blade Throw
- Suicides
  - Attractive Nuisance

Paul Gipe, wind-works.org

How Renewable Energy Can Benefit Farmers

Cros de Georand, France

- #1 Royalties
  - Lowest Risk--Lowest Reward
    - % of Gross Revenue (2-4%)
- #2 Ownership
  - Highest Risk--Highest Reward
    - Farmer Retains Profit

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Royalties & Land Rents

	1-10	10-20	20-30
Coastal Germany	5-8%		
Interior Germany	3-5%		
Cielo Wind Power, NM	6%		
Cappeln Germany	4%	5.9%	5.7%
Indian Mesa, TX	4%	6%	8%
Woodward Mesa, TX	4%	6%	
US BLM, CA	4%		
Freiburg, Germany	3.8%	5.4%	
Portugal	2.5%		
Ontario	1.5-2.5%		

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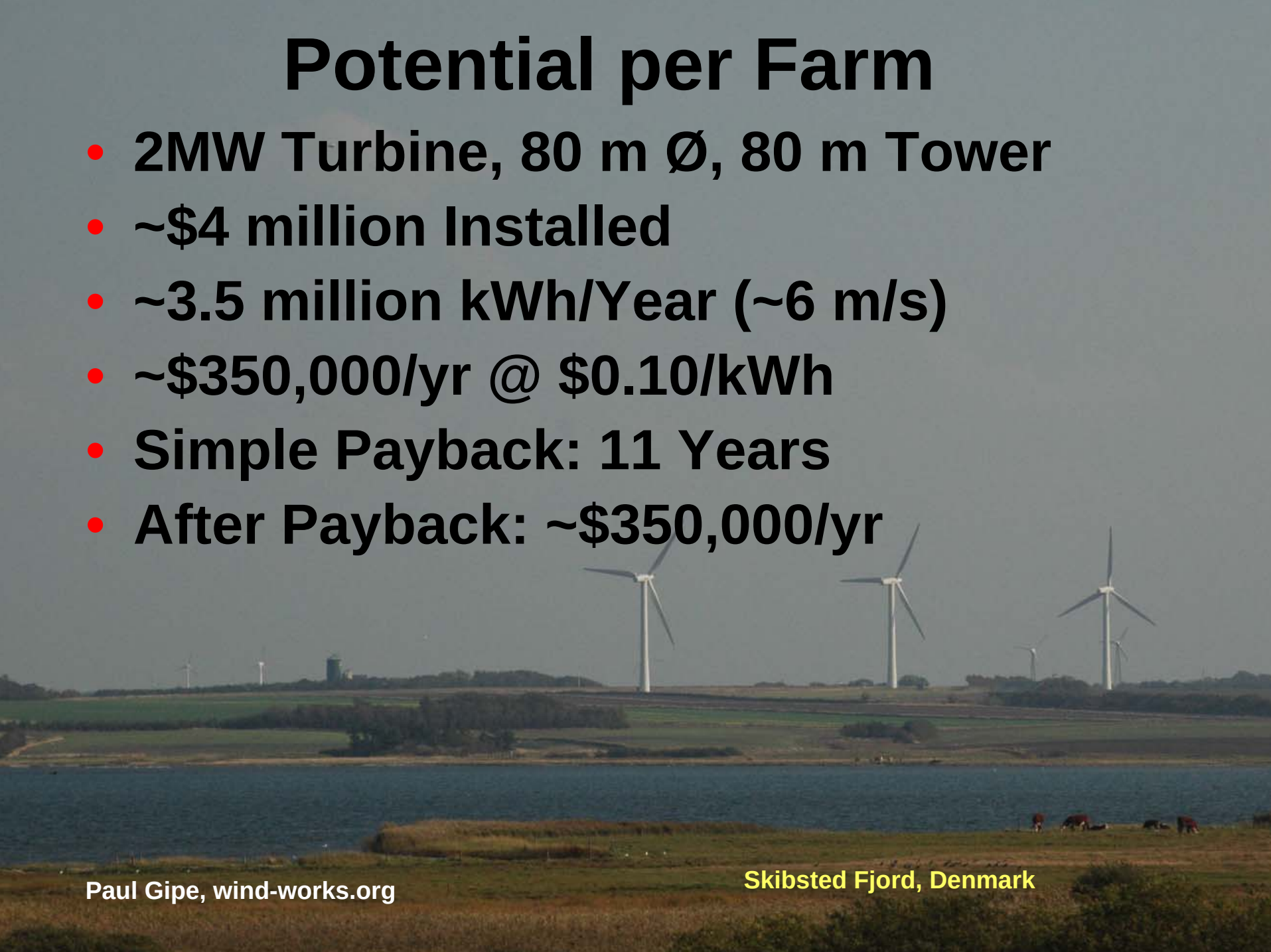
Potential per Farm

- Turbines Use Only ~5-10% Land Area!
- Potential to Significantly Boost Farm Income

Potential per Farm

- 2MW Turbine, 80 m Ø, 80 m Tower
- ~$4 million Installed
- ~3.5 million kWh/Year (~6 m/s)
- ~$350,000/yr @ $0.10/kWh
- Simple Payback: 11 Years
- After Payback: ~$350,000/yr



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Skibsted Fjord, Denmark

Solar PV Growing Rapidly

- 2006: 5,600 MW Worldwide
- 1,600 MW/yr
- $20+ Billion
- Major Markets
  - Germany--750+ MW/yr
  - Japan--350 MW/yr
  - Spain--25 MW/yr?
  - California--50 MW/yr

Paul Gipe, wind-works.org

Rancho Seco, Calfornia

Solar PV in Germany 2006

- 100,000 New Systems
- €4 Billion
- Total of 300,000 Systems
- 750-1,100 MW in 2006!
- Total 2,500 MW
- Costs Dropped 25%
- 300 MW by Farmers!
  - On Barn Roofs, 35 kW each

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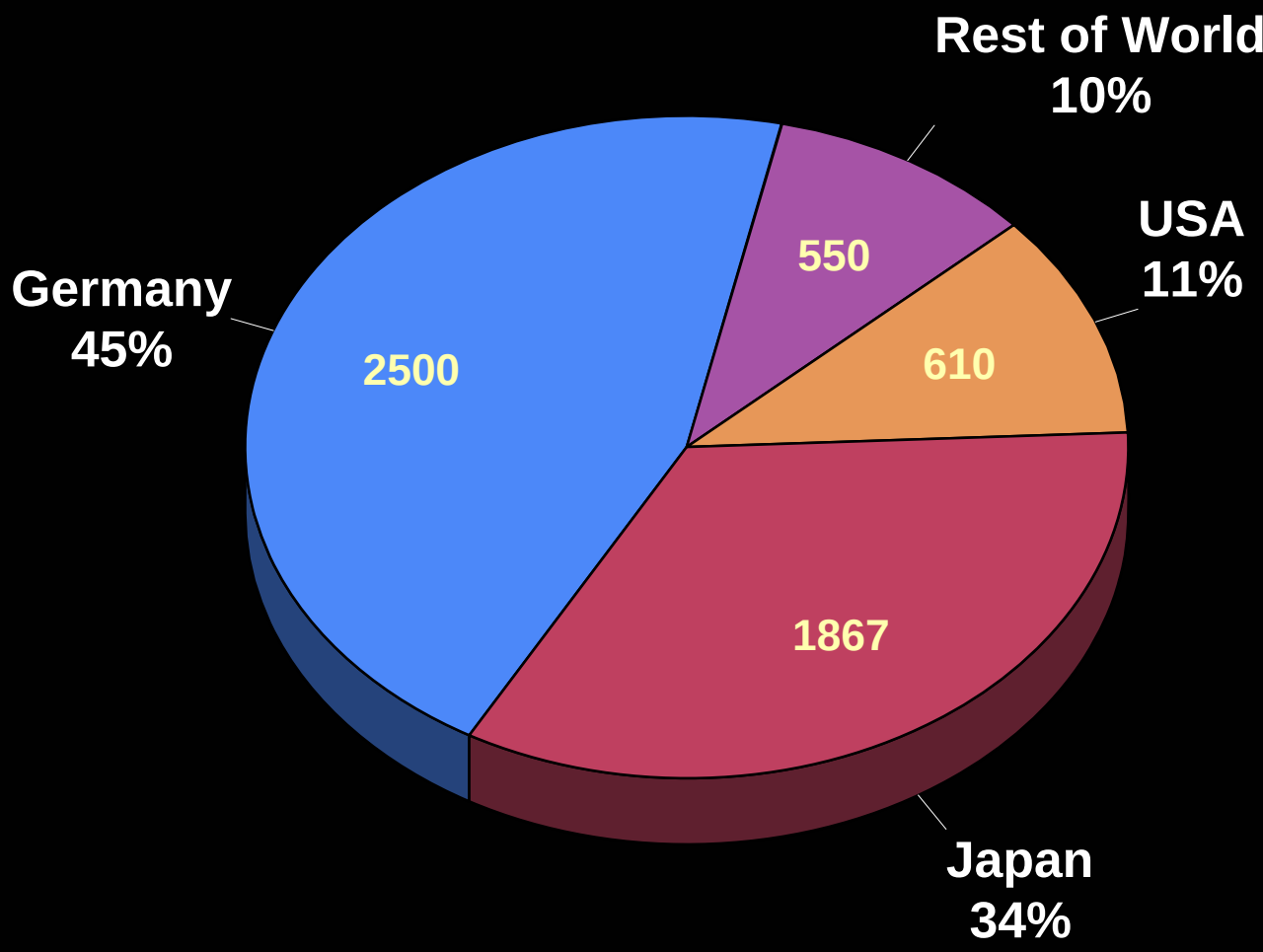
World Total PV Capacity 2006
~1/2 World's PV Capacity in Germany



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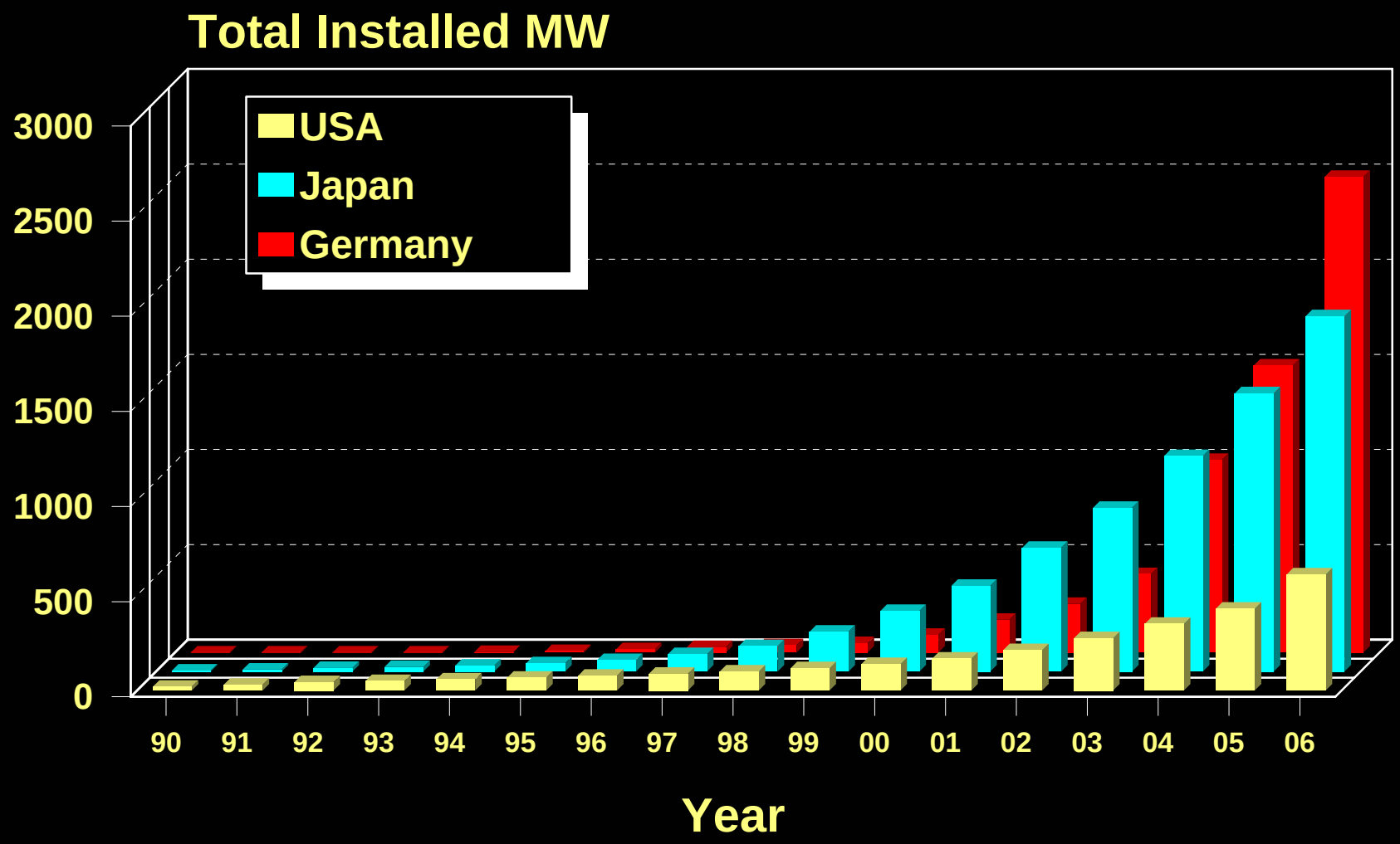
Solar Photovoltaic Development



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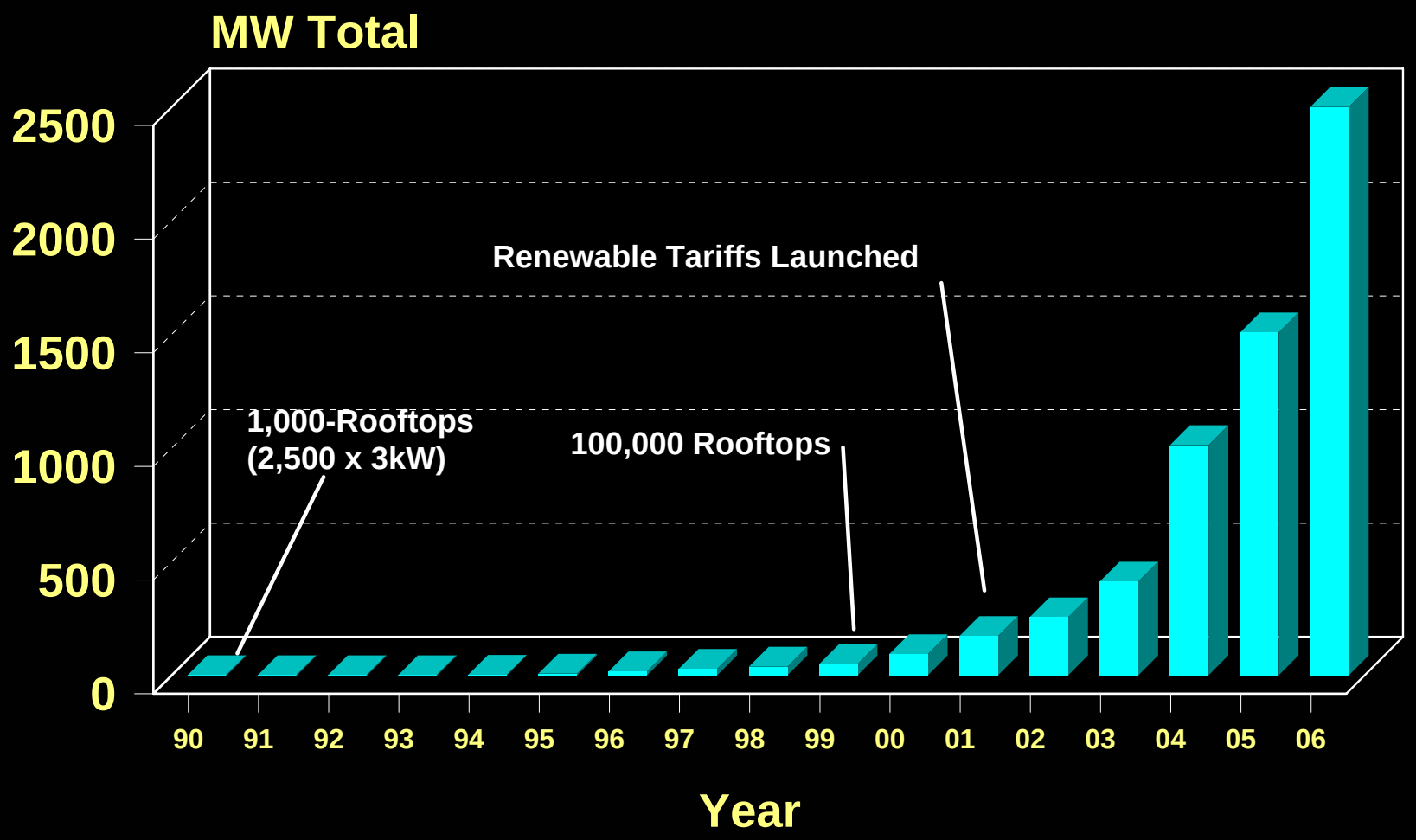
Renewable Tariffs & Solar Photovoltaics in Germany



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German Farms . . .
. . . Solar PV Cash Crop

- **300 MW on Barn Roof Tops in 2006**

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German Granny Flat
What's Wrong with This Picture?

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Near Freiburg, Germany


Schönau, Germany
German Churches . . .
. . . Protecting Creation
Paul Gipe, wind-works.org

German Renewables More than Electricity

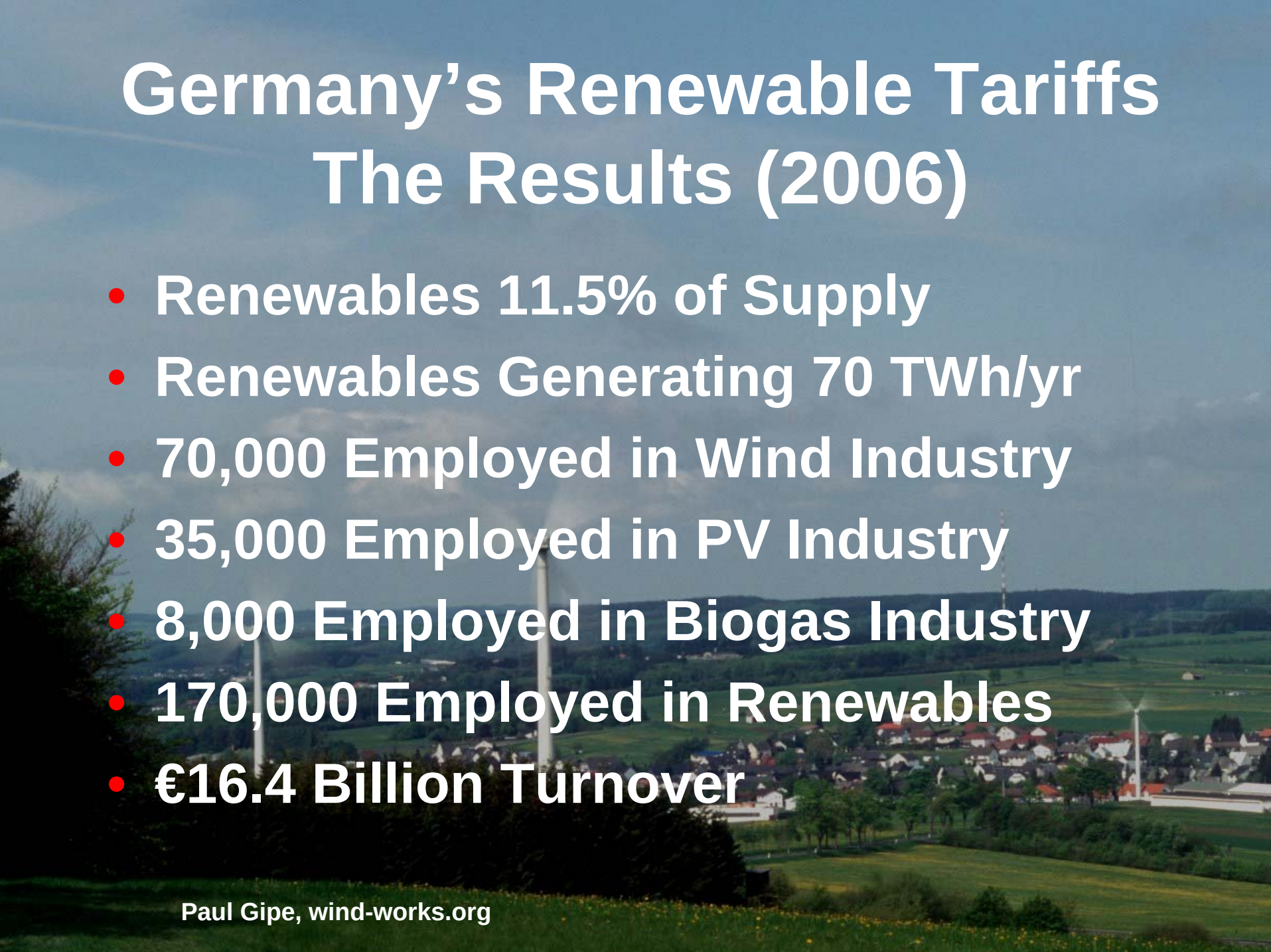
- Hot Water
- Space Heating
- the Hotel Victoria Has it All . . . from Solar Energy

Freiburg, Germany

Paul Gipe, wind-works.org

Germany's Renewable Tariffs The Results (2006)

- Renewables 11.5% of Supply
- Renewables Generating 70 TWh/yr
- 70,000 Employed in Wind Industry
- 35,000 Employed in PV Industry
- 8,000 Employed in Biogas Industry
- 170,000 Employed in Renewables
- €16.4 Billion Turnover



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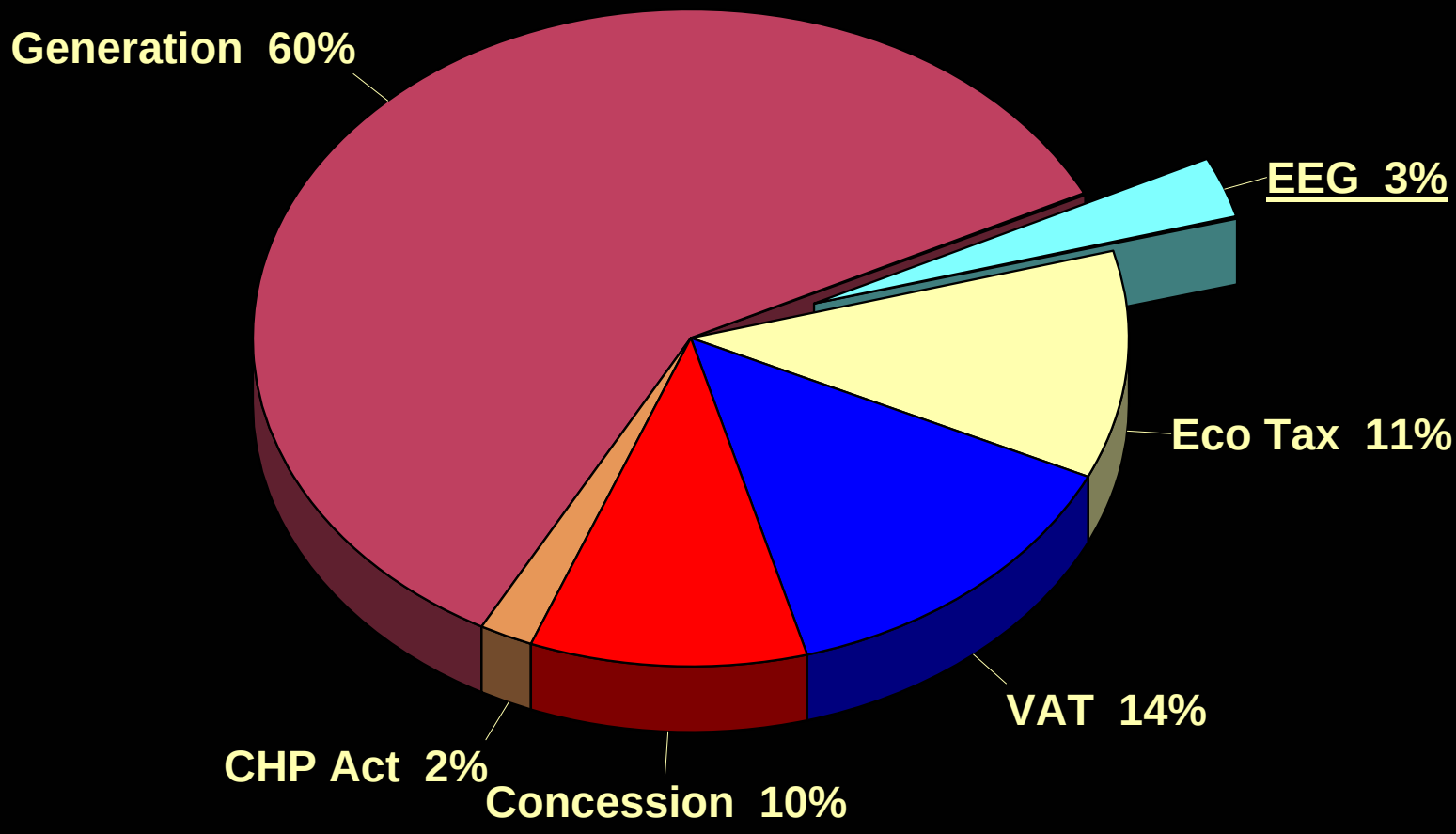
Germany's Renewable Tariffs
The Results

- Renewables ~70 TWh/yr
- 300,000 PV Installations
- 2,000 Biomass Plants
- 550 MW Farm Biogas, 10 TWh/yr
- 6,000 Hydro Plants
- 18,000 Wind Turbines
- Total of ~350,000 Generators!

DeWind

Cost of German EEG



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Höhe Westerwald, Germany
Setting the Stage
Paul Gipe, wind-works.org

Why the European Success?

- **#1 Community Involvement**

  Germany & Denmark

- **#2 Advanced Renewable Tariffs**

  16 EU Countries use Electricity Feed Laws

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Increasing Acceptance #1

“Your Own Pigs Don’t Stink”

Jutland, Denmark

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What Are Our Goals?

- **Primary**
  - High Penetration of Renewables Quickly
- **Secondary**
  - Equitably Distributed Ownership
  - Rural Development
  - Sustainable Manufacturing
  - Distributed Generation
    - Improve Resiliency
    - Reduce Transmission Losses
    - Firm-Up Wind's Variability

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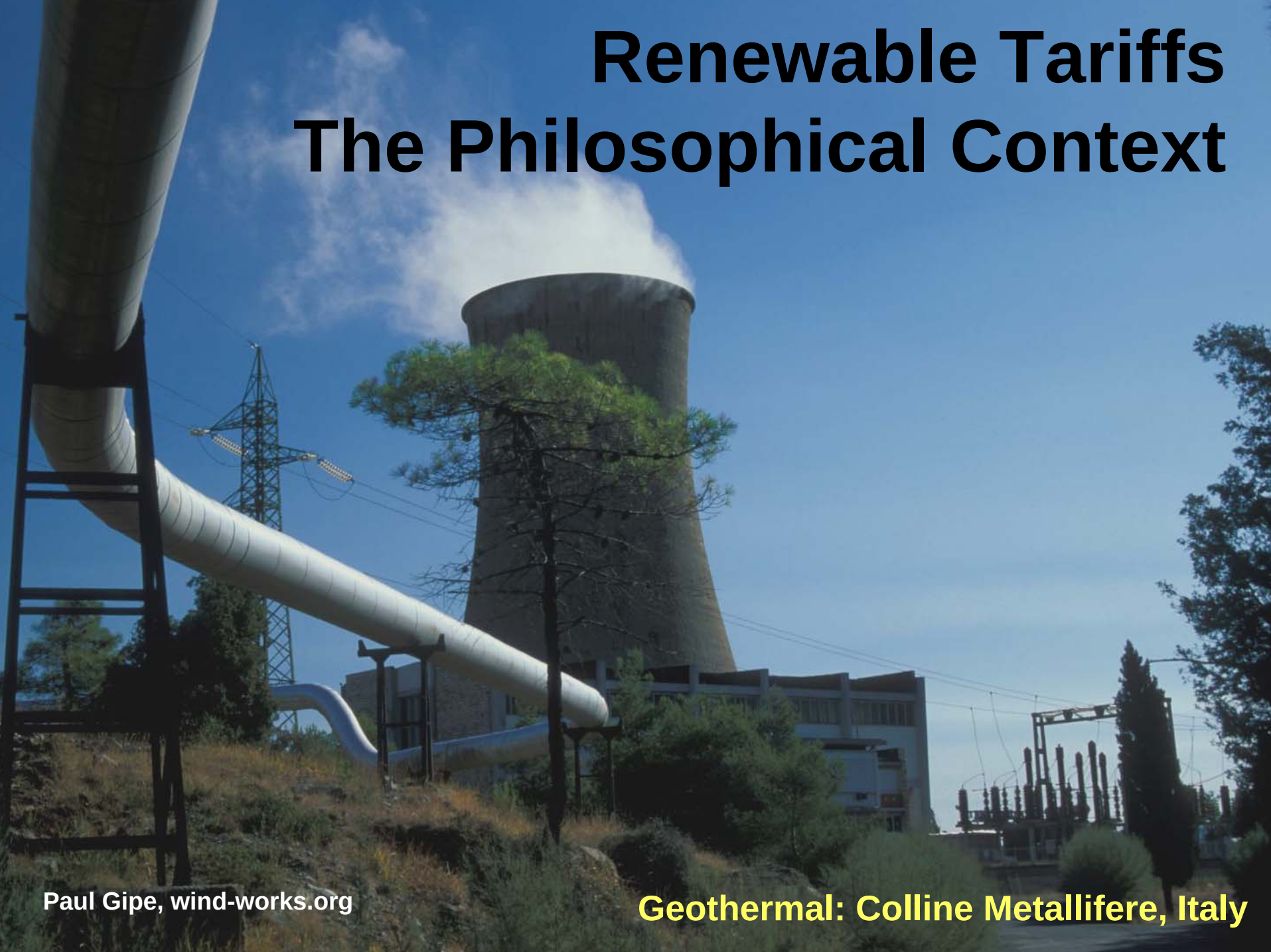
Pincher Creek, Alberta: Shell Gas Plant

Renewable Tariffs
The Philosophical Context



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Geothermal: Colline Metallifere, Italy

1. Do We Want Renewables?

- Peak Oil, Peak Gas
- Nuclear Problematic
- Climate Catastrophe
  - Europe, 2003: 52,000 Dead
- Public Support High
  - Enthusiasm Not Seen in 20 Years
- <u>Desire for New Manufacturing Jobs</u>

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2. If Yes, Then What Works Best?

- **Who Gets Contracts (PPAs)**
  - **Elite Few or All Who Want Them?**
- **How To Pay For Them**
  - **RECs/ROCs/Green Tags**
  - **Subsidies (PTC, WPPI)**
  - **Advanced Renewable Tariffs**

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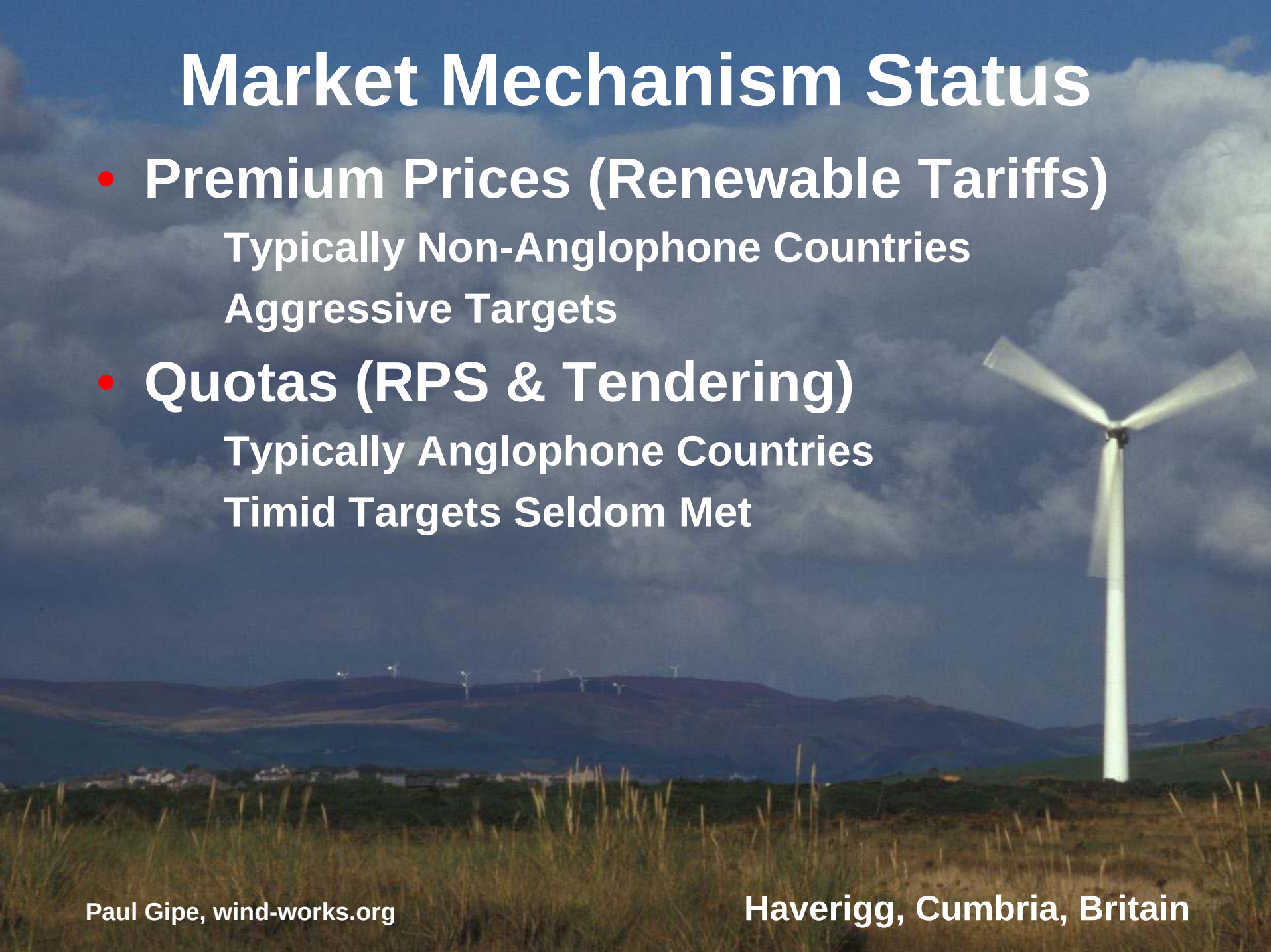
Dunkerque, France

Market Mechanism Status

- **Premium Prices (Renewable Tariffs)**
  - Typically Non-Anglophone Countries
  - Aggressive Targets
- **Quotas (RPS & Tendering)**
  - Typically Anglophone Countries
  - Timid Targets Seldom Met



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Haverigg, Cumbria, Britain

Advanced Renewable Tariffs

- **Deliver More Capacity--**
  --More Quickly
  --More Equitably

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Advanced Renewable Tariffs

- **What Are They?**
  - Feed Laws or Minimum Price Systems
  - Political Price, Not Political Quota
  - Simple Contracts
- **How Do They Work?**
  - Simple, Comprehensible, Transparent, Little Administration
- **Where?**

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Renewable Energy Tariffs Status

Standard	Non-Standard	Pending	Proposed
Austria	Czech Republic	Hungary	Japan?
Brazil	Ireland		Quebec?
France	Minnesota C-BED		
Germany	PEI, Canada		
Greece	Washington State		
Italy (PV)	Turkey (Wind)		
Ontario			
Portugal			

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Renewable Tariff Design

- Price Sufficient to Drive Development
- Fair But Not Undue Profit
- Sufficiently Differentiated
  - For Different Technologies
  - For Different Applications
  - For Different Sizes
  - For Different Regions
  - For Different RE Intensities

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Renewable Tariffs: Trend Growing in North America?

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Husum, Germany

Renewable Tariffs in North America . . Unthinkable?

- Yes--Just 3 years ago
- Today? No
- Now Possible
- Growing Trend

  in both USA & Canada

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WindShare, Toronto

California's Original Wind Tariff
Interim Standard Offer Contract #4

- 1983: ISO4
- Commercial Wind Industry Begins
- 1985: ISO4 Suspended
- 1984-1990: ~1,500 MW of Wind Installed
- Wind Produces ~1% of Supply

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San Gorgonio Pass circa 1990

Evolution of Market Mechanisms

- ARTs Developing Momentum
- RPS/Quota May Have Peaked
  - Exemplars Weakening
    - California?
    - Britain?

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Montjoyer, France

Advanced Renewable Tariffs North American Endorsements

- **Ontario**
  - Liberal Party, 2004
  - Green Party, 2006
- **Canada's Federal NDP 2006**
- **NGOs**
  - NFU, GLU, BCWEA, CanWEA, CanSIA
  - Sierra Club (USA), DSF (Canada)
  - RENEW Wisconsin (USA)

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Ferndale, Ontario

Advanced Renewable Tariffs Momentum in North America

- Prince Edward Island (Canada)
- Washington State
- Minnesota C-BED
- California (PV)
- Ontario

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Freyssenet, France

Ontario's Standard Offer Program

"The Most Progressive Renewable Energy Policy in North America in Two Decades"

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Igny, Lorraine, France

Advanced Renewable Tariffs for Ontario

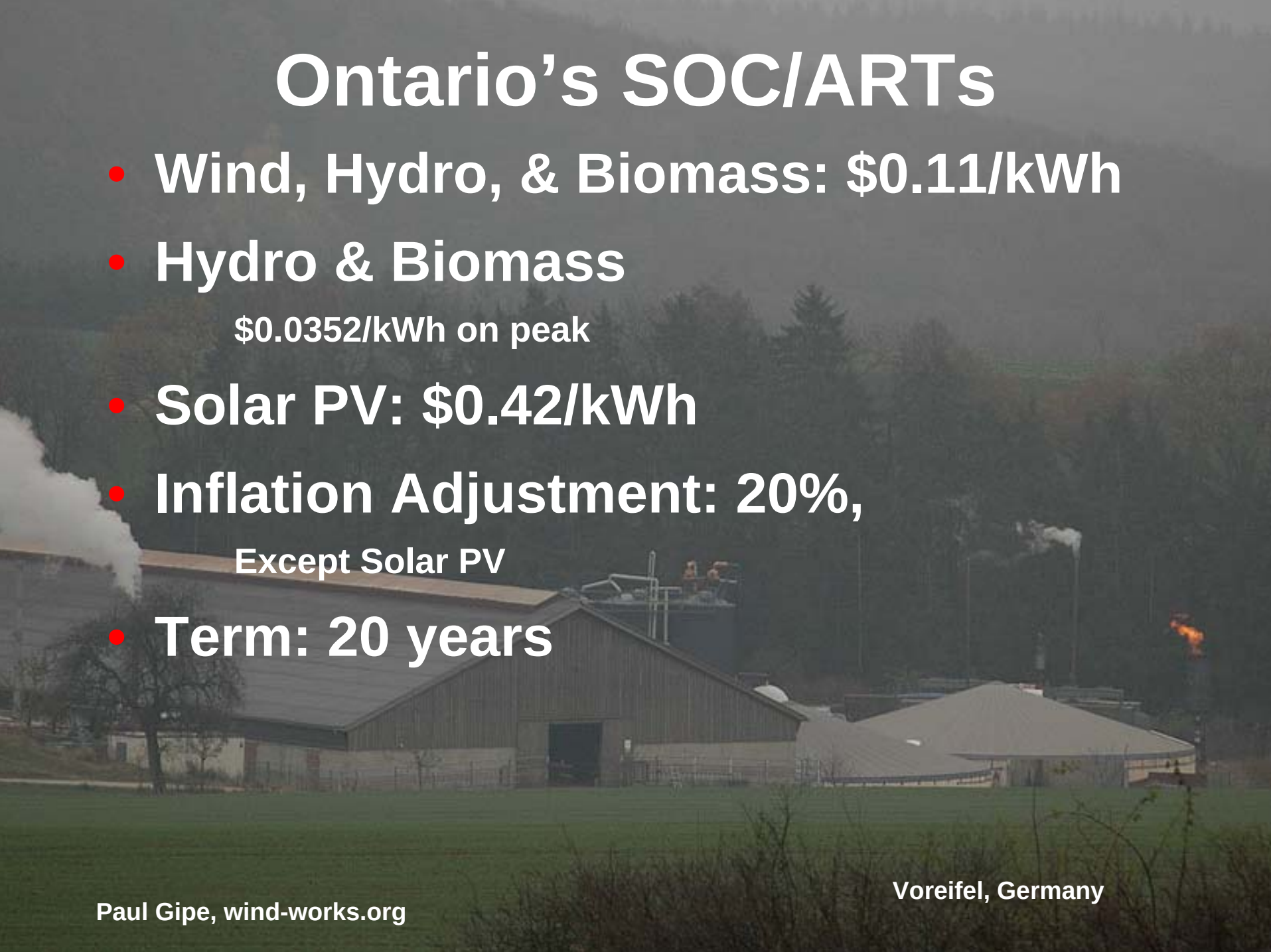
- 20 Year Contracts
- <44kV, <10 MW
- Wind, Solar, Hydro, Biomass
- Inclusive--Open to All
- No Program Cap

Ontario's SOC/ARTs

- **Wind, Hydro, & Biomass: $0.11/kWh**
- **Hydro & Biomass**

  $0.0352/kWh on peak
- **Solar PV: $0.42/kWh**
- **Inflation Adjustment: 20%,**

  Except Solar PV
- **Term: 20 years**



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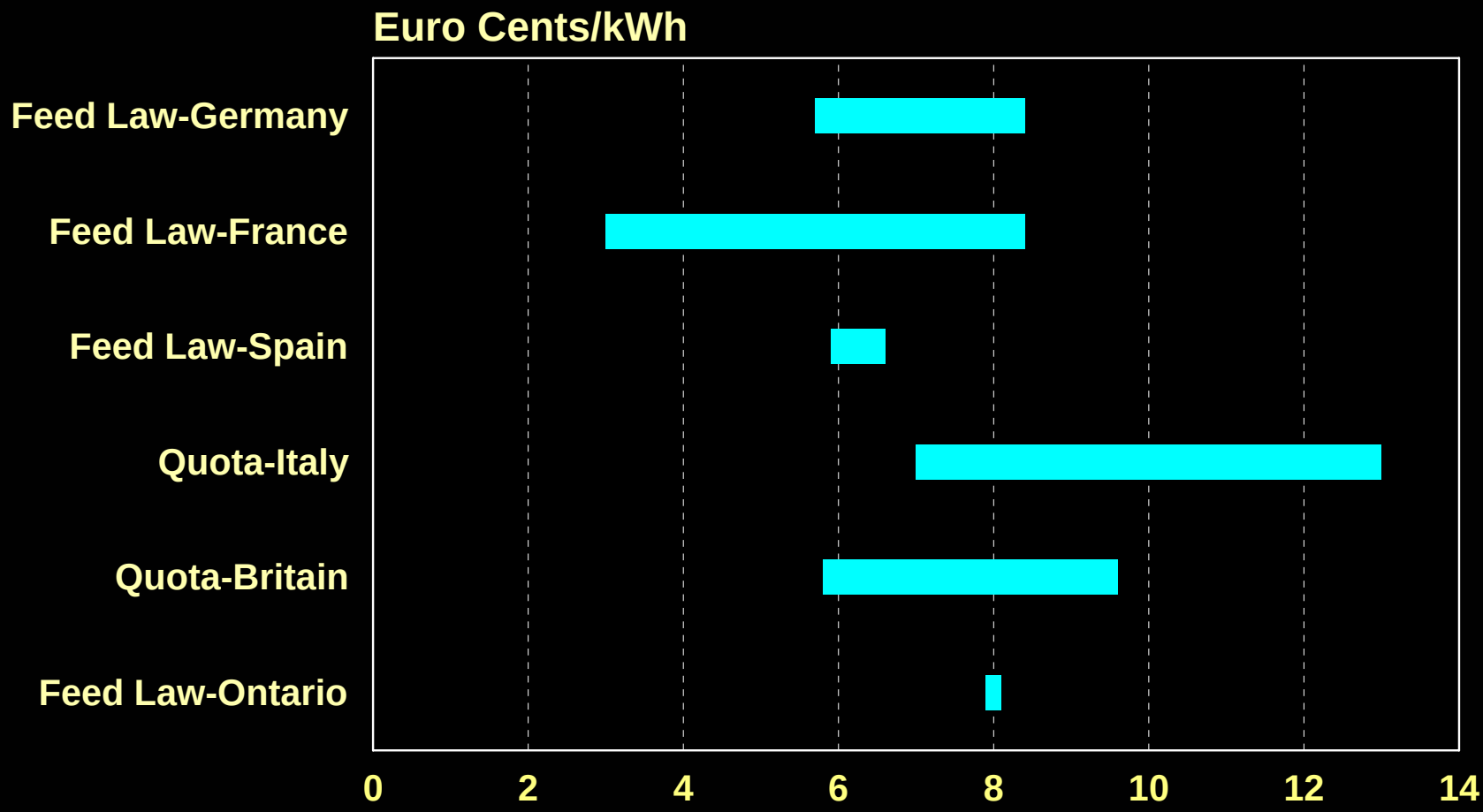
Voreifel, Germany

Prices Paid for Wind Energy in Europe



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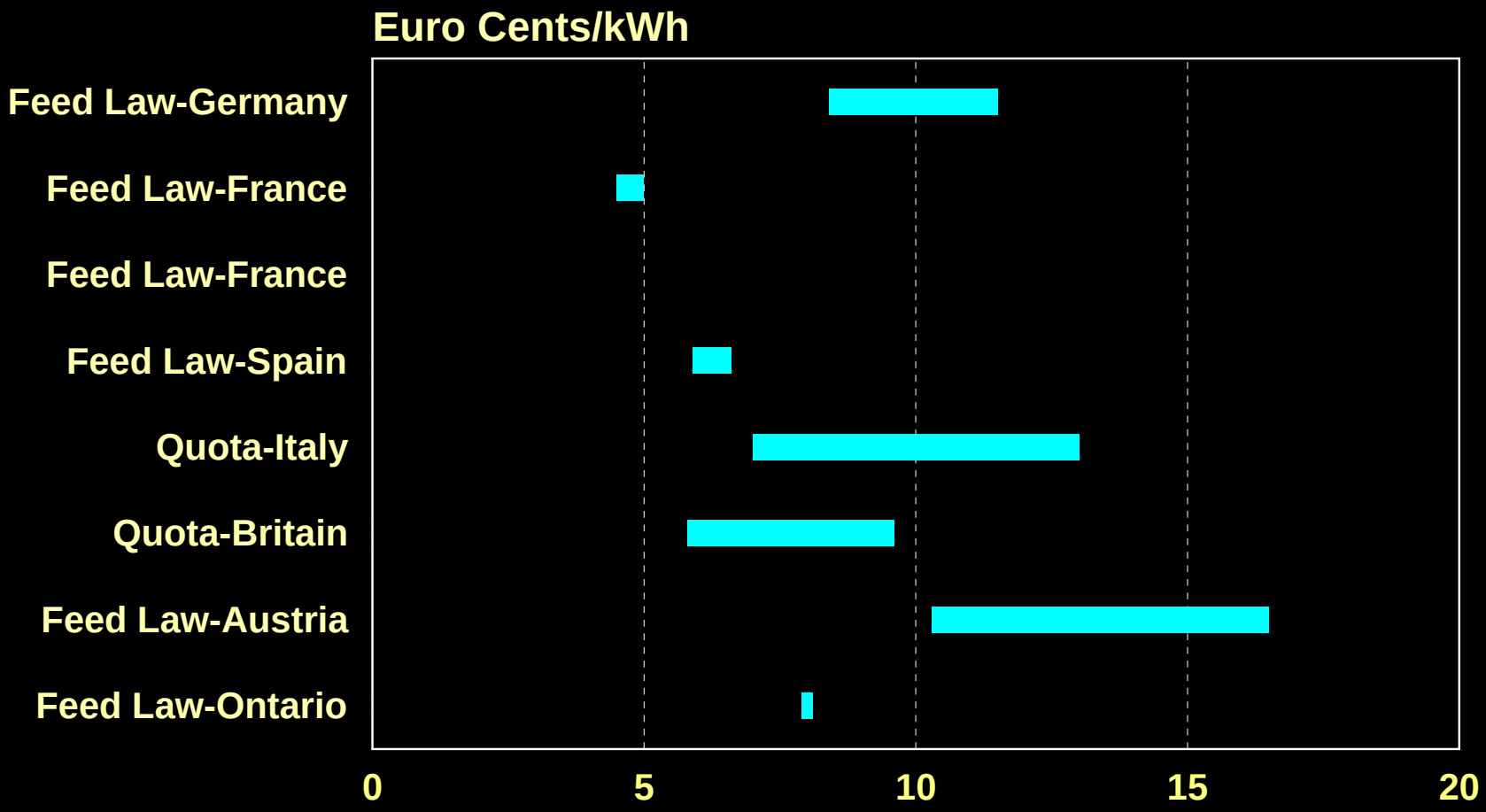
Prices Paid for Biomass in Europe



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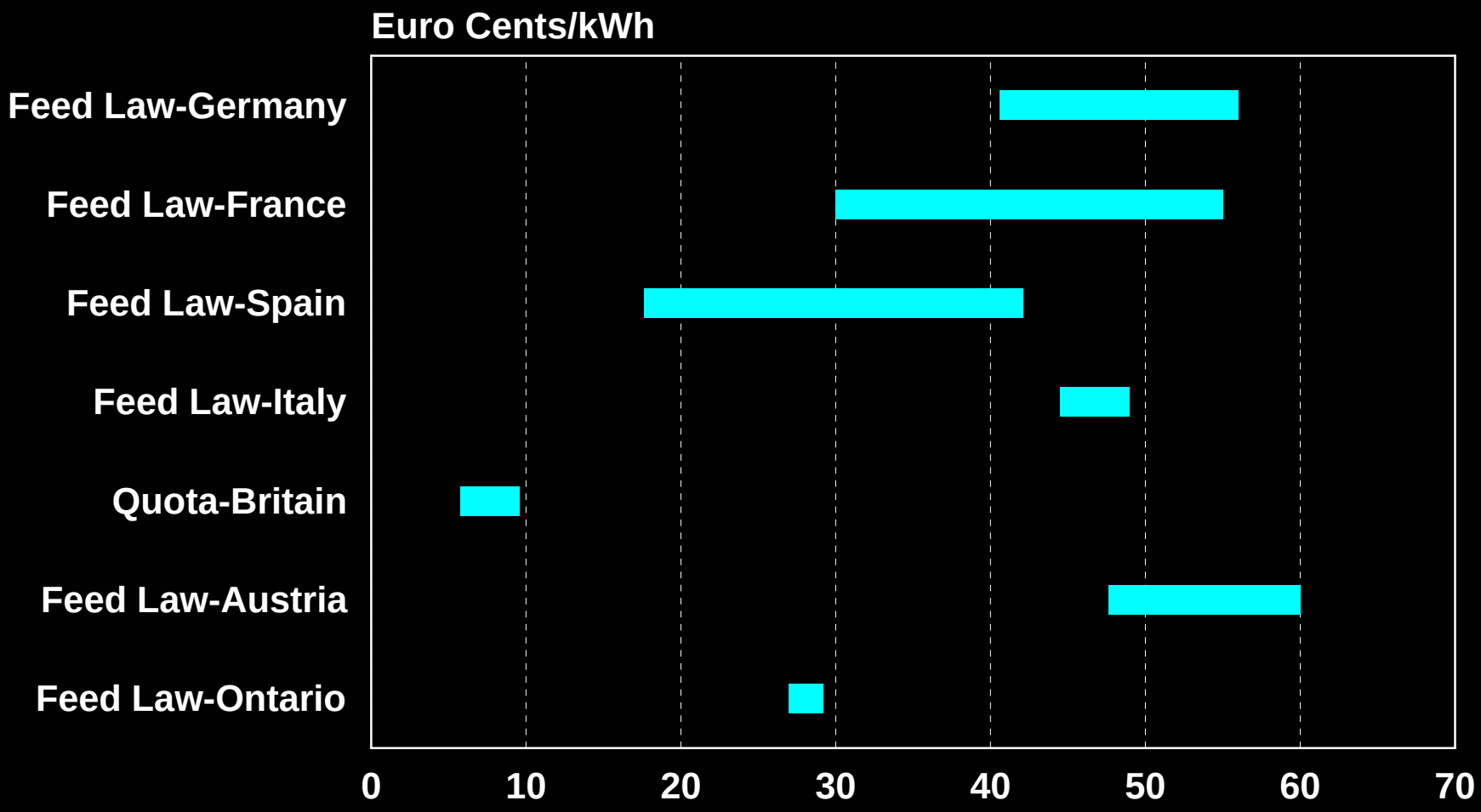
Prices Paid for Solar PV in Europe



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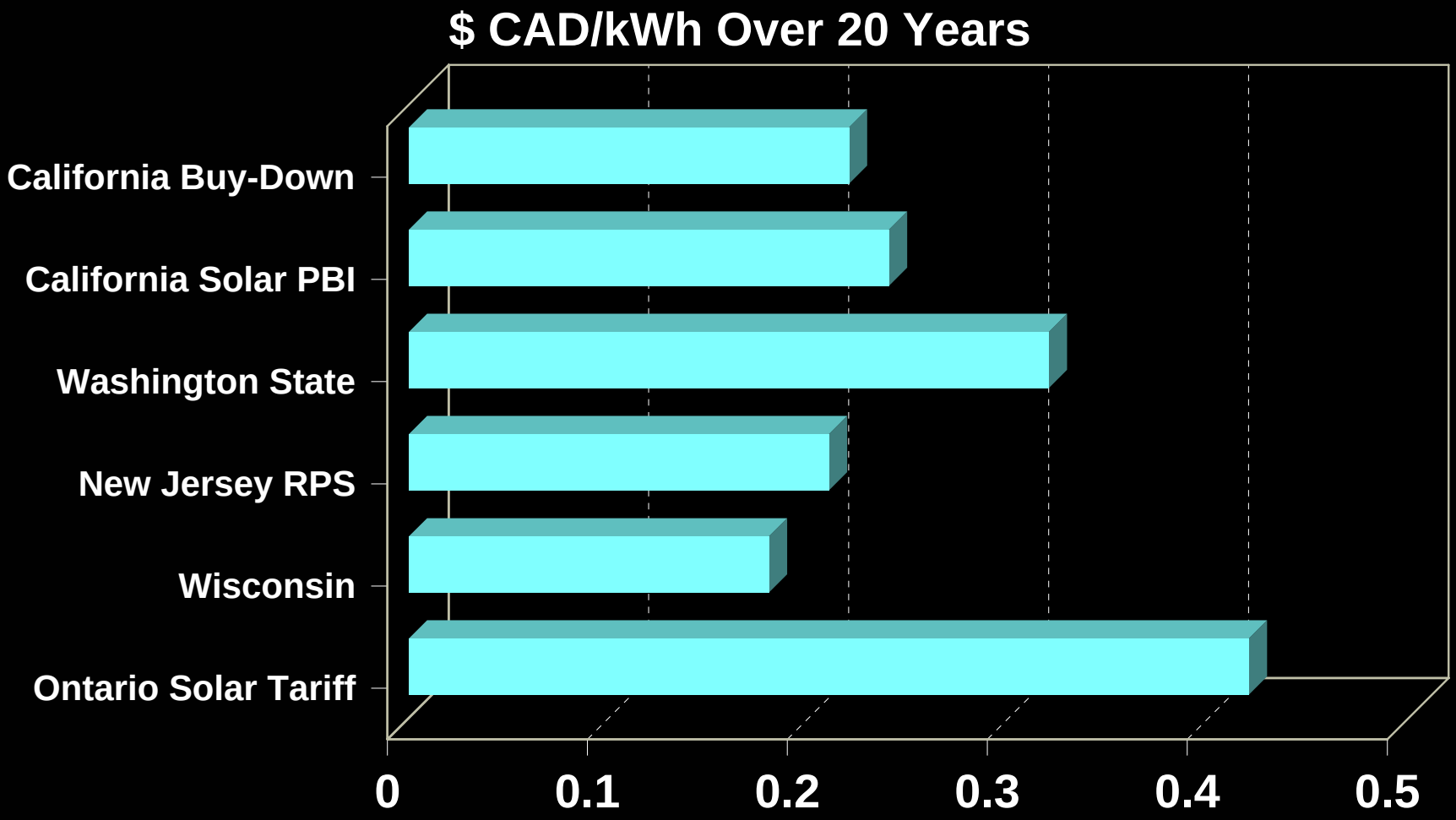
Ontario Solar Tariff
North American Comparison



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Ontario's Standard Offer Program
What's Next?

- 2 Year Review
- Revisit
  - Prices
  - Increase Differentiation
  - Differentiated Tariffs for Wind
  - Inflation Indexing (60%)
- Add Offshore Wind
- Add Solar Thermal

Igny, Lorraine, France

Paul Gipe, wind-works.org

Advanced Renewable Tariffs
A Question of Equity

- **Feed Laws are Fair**
- **Nearly All Can Play**

  Farmers, Ranchers, First Nations, & Co-ops

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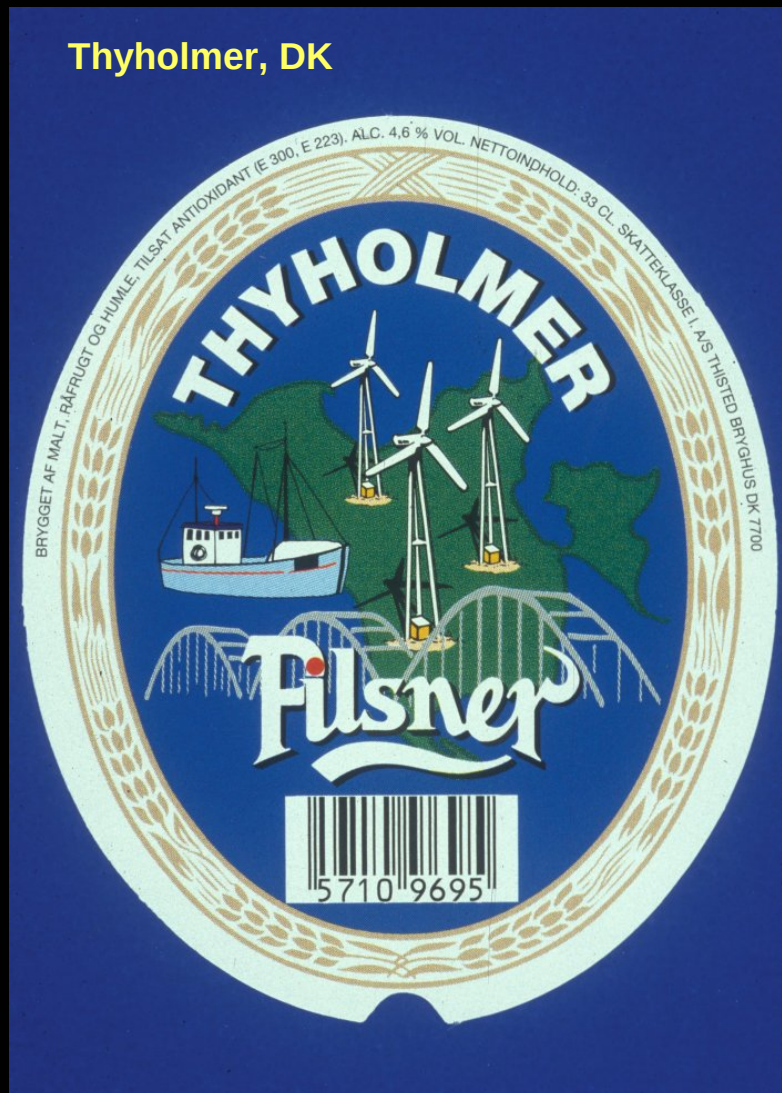
Buffalo Ridge, MN

Wind Turbines
. . . Sell Beer, Bier, Biere, Birra, Cerveza

Thyholmer, DK



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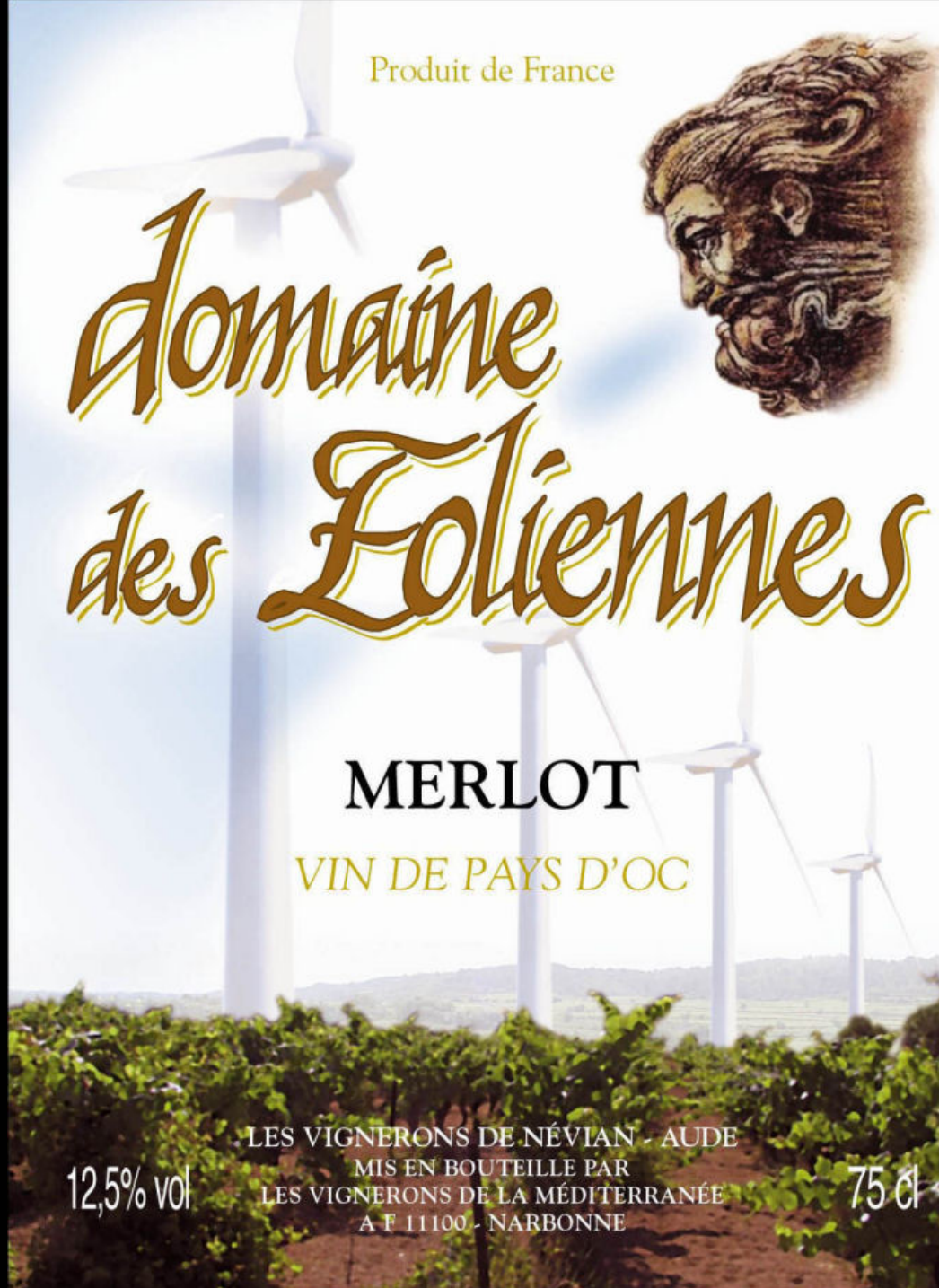
. . . Sell Wine



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. . . Sell Clothes

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Cathy Sims, Palmerston North, New Zealand

. . . sell Texas Towns--Yee Ha!

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Renewables:

When You Look Closely . . .

. . . Worth Every Cent

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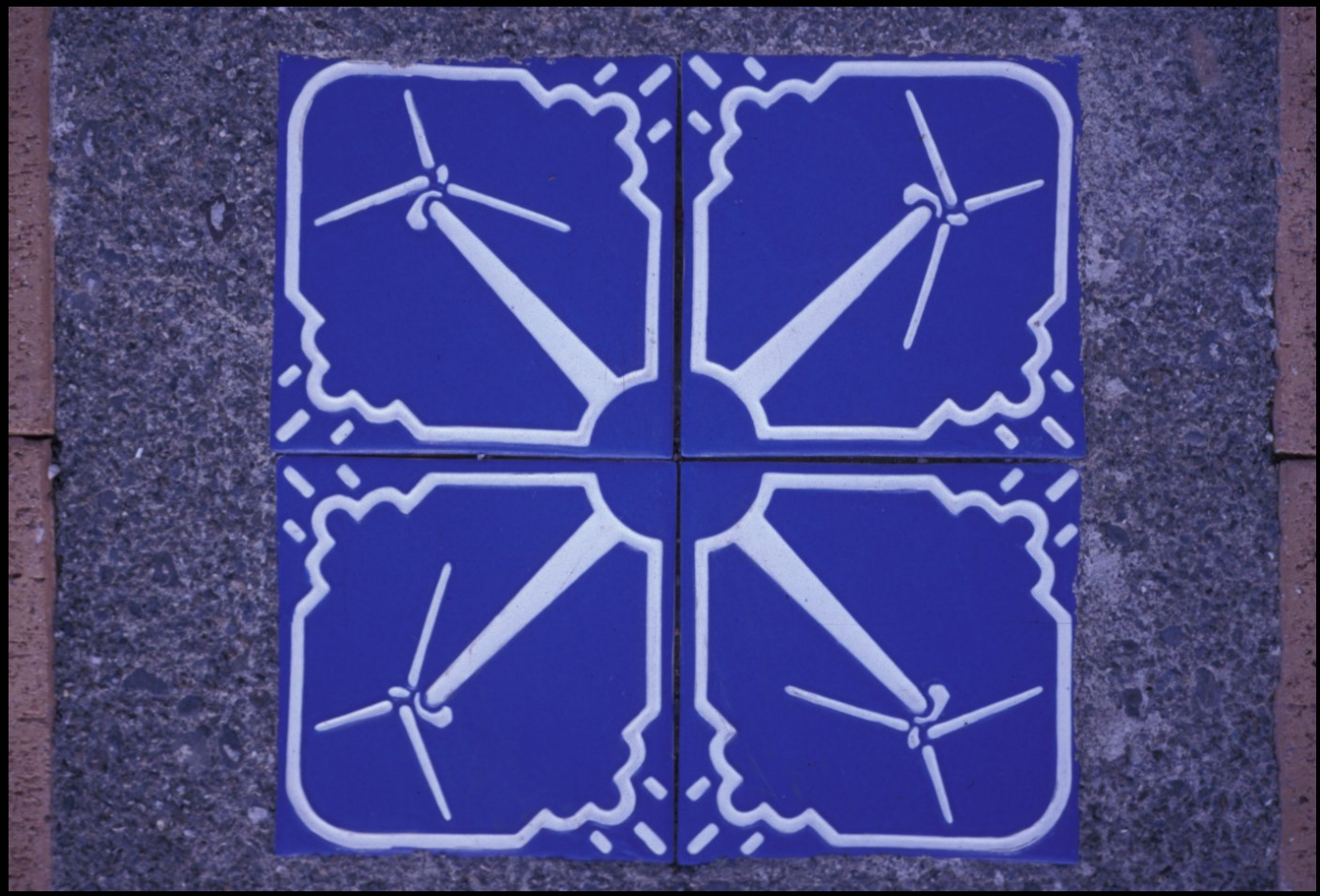
. . . Pave the Sidewalk

And the Way to the Future



Paul Gipe, wind-works.org

Wellington (Brooklyn), NZ

Renewable Energy . . .
For Today and for Tomorrow

Technology for Life*

Paul Gipe, wind-works.org

*from N.F.S. Grundtvig

Renewable Tariffs--New Policy Option for North America

www.wind-works.org

Manawatu Gorge, New Zealand